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NOTE FROM THE CO-ORDINATOR

In response to requests to include more news items, in this, the fourth, issue of the *Information Bulletin* we have expanded the section on publications. We have also started an information section on projects, meetings and other activities in and on the region, relevant to the topic of the SIG. To be useful, both these sections depend heavily on readers supplying us with publications, reports, ephemera, and other information.

We continue to include short articles. In this issue we have an interesting contribution by William Sunderlin, which expands on Dan Pauly's paper on Malthusian overfishing, published in the last *Information Bulletin* (No.3, Jan. 1994). Dr. Sunderlin stresses that although human population growth is indeed the primary pressure on inshore fisheries resources, it is important that due weight also be given to such prior causal factors as the distribution of power and authority in any society, income distribution, and technological development, among others.

In a characteristically practical paper, Bob Johannes summarises the kind of training and research required to enable government researchers and managers to perform better in village-based cooperative management schemes. Taking the same practical approach, Andrew Smith and Paul Dalzell provide a summary of the fish stock depletion experiments they conducted using traditional fishing methods on Woleai Atoll, Yap State, FSM. (cont'd page 2)

Inside this issue

PIMRIS is a joint project of 4 international organisations concerned with fisheries and marine resource development in the Pacific Islands region. The project is executed by the South Pacific Commission (SPC), the South Pacific Forum Fisheries Agency (FFA), the University of the South Pacific's Pacific Information Centre (USP-PIC), and the South Pacific Applied Geoscience Commission (SOPAC). Funding is provided by the International Centre for Ocean Development (ICOD) and the Government of France. This bulletin is produced by SPC as part of its commitment to PIMRIS. The aim of PIMRIS is to improve the availability of information on marine resources to users in the region, so as to support their rational development and management. PIMRIS activities include: the active collection, cataloguing and archiving of technical documents, especially ephemera ('grey literature'); evaluation, repackaging and dissemination of information; provision of literature searches, question-and-answer services and bibliographic support; and assistance with the development of in-country reference collections and databases on marine resources.

PIMRIS

Pacific **I**slands **M**arine **R**esources **I**nformation **S**ystem

Both those contributions are derived from papers presented at the International Workshop on Traditional Marine Tenure and the Sustainable Management of Marine Resources in Asia and the Pacific, held at the University of the South Pacific last July (see note in the Information Section).

A fourth contribution, by Michael D. Lieber, describes traditional fishing methods and strategies on the Polynesian atoll of Kapingamarangi, Pohnpei State, FSM. It is based on his recently published monograph, *More than a living: fishing and the social order on a Polynesian atoll*, Westview Press, Boulder (1994). This monograph will be reviewed in the next *Information Bulletin*.

Kenneth Ruddle

Beyond Malthusian overfishing: The importance of structural and non-demographic factors

*by William D. Sunderlin**

Abstract

Daniel Pauly's concept of Malthusian overfishing states that fisheries over-exploitation in tropical developing countries is caused primarily by excess human population. While it is certainly true that growing numbers of people are causing pressure on fishing resources, the concept of Malthusian overfishing downplays other, possibly causally prior factors such as relations of power in society, income distribution, and technological development. This article points out some possible pitfalls of making family planning the cornerstone of efforts to alleviate fishing pressure.

Introduction

Daniel Pauly (1993) has defined 'Malthusian overfishing' as a situation where small-scale fishers in developing countries engage in 'wholesale resource destruction in their effort to maintain their incomes.'

The cause of this situation is seen to be an excess of fishers over available resources, and an inability of fishers to move to other forms of employment, even in the face of resource decline, because of lack of alternative employment opportunities. Pauly (1993) states that the key element in a strategy to mitigate Malthusian overfishing is to provide women the means to limit the number of children they want to bear. He also proposes alternative employment opportunities, 'traditional' management mechanisms, 'modern' gear restrictions, and sanctuaries as means to alleviate pressure on fisheries.

There is good reason for drawing attention to the issue of population in fishing villages. Clearly, the number of people in artisanal fisheries has exploded in recent decades, with dire consequences for the state of coastal and aquatic resources. The prognosis is that the population of coastal areas will grow enormously in decades to come (WRI/UNEP/UNDP, 1992). Be that as it may, it may be ill-advised to put population control front and centre among the possible ways to confront the problem of overfishing.

There are four general reasons for this. First, rapid population growth may be an epiphenomenon of other social forces causing overfishing. Second, small-scale fishers are not the only party responsible for over-exploitation of coastal fisheries. Third, some of the growth in the numbers of small-scale fishers may not be attributable to population growth *per se*. Fourth, it is not clear that the path out of fishing to non-fishing livelihoods is blocked, as is commonly thought. This article will explain each of these four lines of reasoning in sequence.

It should be noted in advance that there are not sufficient data to support the concept of Malthusian overfishing. Nor are there sufficient data to refute the concept out of hand. It is possible, however, to raise preliminary objections at the level of theory and on the basis of case study information. This article will merely summarise some of these preliminary objections while pointing out the need for further research.

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Theories of population growth

One of the central tenets of Malthusian and neo-Malthusian theory is to see the growth of human population as an independent, exogenous force governing the state of human affairs.[1] It has frequently been stated in neo-Malthusian writings, for example, that population increase is the primary cause of poverty, famine and environmental degradation.[2] It has also been assumed in neo-Malthusian theory that parents who bear children beyond the limits of their material resources are being irrational.

Non-Malthusian theory reverses this causal sequence and sees rapid population growth in the developing world as a consequence of poverty and income inequality.[3] A corollary of this view is that poor people bear large numbers of children as a rational survival strategy. Often, for resource-poor families, it is argued, the larger the number of children, the larger the amount of household income from childhood labour and remittances, and the greater the degree of security of parents when they reach old age. The implication of this theory is that rapid population growth can only be adequately addressed by first taking measures to alleviate poverty.

Over the years, proponents of both theories have made concessions. For example, some of the more ardent past proponents of neo-Malthusianism now readily acknowledge that socio-economic conditions have a strong role in conditioning fertility rates.[4]

Many non-Malthusians concede that there is much unmet demand for family planning services among the poor in developing countries. However, significant differences between the two bodies of theory remain.

The point here is not to take sides in the demographic debate, but rather to point out that — regardless of what theory is assumed — it is by no means clear that fertility control should be the first order of business in confronting overfishing. In fishing villages where poverty underlies a perceived need to have many children, a focus on family planning will not be an effective way to safeguard the fishery. In fishing villages where there is unmet demand for contraception and fertility control, family planning will not be an effective way to safeguard the fishery. In this situation, family planning services may help in alleviating resource pressure. However, for reasons that are explained below, even in the latter case, we must be wary of exaggerated expectations of how much fertility control can, or even should, accomplish toward resolving the problem of overfishing.

Commercial exploitation of coastal fisheries

Small-scale and commercial fishers often compete for the same resources in coastal capture fisheries (Smith, 1979; Thomson 1980; Bailey, 1986; Bailey, 1987a). In some cases, we know that the proportion of fish taken by commercial gears is quite substantial.

In San Miguel Bay, Philippines, it was found in 1980 that 75 small trawlers, 3 per cent of the fishing units, were earning more than the remaining 2,300 fishing units in the Bay (Smith & Mines, 1982). On the north coast of Java, small-scale fishers experienced a serious decline of catches and some were forced to leave fishing as the numbers of commercial trawlers grew in the 1970s (Bailey, 1986; Bailey, 1987a; Bailey, 1988). With the imposition of a trawl ban in 1980, there was a remarkable recovery of demersal fish stocks (Dwiponggo, 1992), the fisheries were able to accommodate a growing number of small-scale fishers, and the incomes of these fishers reportedly grew (Bailey, 1987a; Chong et al., 1987).

These two cases suggest that we cannot conclude that a growing number of small-scale fishers is invariably the primary cause of overfishing. The experience in North Java should provoke us to ask if there are other fisheries in the developing world where a ban on trawls or other forms of commercial fishing might alleviate fishing pressure and also raise the living standards of marginal fishers. Furthermore, in cases where the premises of non-Malthusian theory are correct, a trawl ban and subsequent increase in the living standard of marginal fishers might help induce those fishers to bear fewer children.

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[1]Malthusian theory (as espoused by its originator, the economist Thomas Malthus) promoted sexual abstinence, celibacy and delayed marriage as the means to control fertility. The theory did not promote contraception, viewing it as a vice. Neo-Malthusianism differs in believing that contraceptive technology is a necessary and harmless means to control population (Humphrey & Buttel, 1980:36 & 72).

[2]See for example Ehrlich (1968), Hardin (1977), and Brown et al. (1985).

[3]See for example the work of Mamdani (1972) and Murdoch (1980).

[4]Of particular note is the change over time in the writings of Ehrlich (1968, 1991) and passages on population in the State of the World reports of the Worldwatch Institute.

Migration into the fishing sector

In his article, Pauly (1993) explains that population increase in artisanal fishing villages results both from internal growth and also from migration into these villages[5]. It is possible to argue that migration of resource-poor people into fishing is merely part and parcel of the broader problem of excessive human population growth at-large in a given country. But this is not necessarily the case. Entry into fishing can also be viewed as a shift in employment caused by various forms of migration-inducing factors. Among these we might consider distributional, technological, and ecological causes of displacement.

'Distributional displacement' would involve the migration of people as a result of a re-apportionment of resources from less powerful to more powerful sectors in society. A national-level example would be appropriation of land resources by rural elites, forcing farmers (under conditions of resource scarcity) to look for non-farm employment.[6] An international-level example might be the combined effects of the declining world prices for primary agricultural commodities since the early 1980s, and the declining terms of trade and increasing debt of developing countries. Lower profits, in particular for marginal agricultural livelihoods, may have propelled some people into fishing.

An example of 'technological displacement' would be the effect of farm mechanisation on the rural labour force. Investment in large-scale, capital-intensive agriculture and the use of 'labor-saving' machinery is one of the reasons for migration out of farming (UNFPA 1993:13).[7]

'Ecological displacement' may be one of the reasons for increasing population in fishing villages. Examples would include farmers entering fishing after trying and failing to make a living on marginal / fragile land, or fishers migrating from an over-exploited fishery to one not yet overfished. Here again, one of the underlying causes may be overall population growth, but we cannot ignore possible non-demographic causes of ecological damage. For example, farming in ecologically sensitive areas can result from 'distributional displacement', or from other factors disrupting the lives of rural people.

The case of south-eastern Rajasthan in India is instructive. There, the government has assisted 2,300 people in three tribal groups to transfer out of forest-degrading livelihoods and into fishing. An excess of people over available land resources was clearly part of the problem. However, another dimension of the problem is the ethnic history of the region. The tribal groups have taken refuge in hilly lands and jungles to avoid persecution by the dominant Rajput people; this is one key reason why they have taken up forest-based employment on marginal land (Kulshreshtha, 1990).

Spontaneous adjustment to overfishing

Pauly (1993) notes that alternative employment options for fishers are limited and he implies that labour mobility and / or migration out of fishing is not a leading option for mitigating overfishing. This may be true in some settings, but not others.

Panayotou & Panayotou (1986), in their longitudinal study of Thai fishing villages in four coastal provinces, found that mobility in and out of the villages is considerable and that '(m)obility of labour out of fishing is, if anything, greater than mobility into fishing'.

Research in overfished San Miguel Bay, Philippines, found that although the absolute numbers of fishers had increased between 1939 and 1980, there had been a substantial net outmigration over that period of time (Bailey, 1982). A recent study of the same area found that the population of the Bay's 74 fishing villages had grown 25 per cent between 1980 and 1993, but the numbers of fishers had declined (unpublished data). It appears that under conditions of overfishing, the local non-fishery sector has been absorbing a greater share of growth in the labour force than in the past and may also be accommodating some people who have left fishing. Since many of the government's efforts to provide alternative employment for fishers in the Bay have failed, one can only conclude that there

[5]For references to movement from agriculture and inland areas into coastal fishing in developing countries, see Cordell (1973), Smith (1979), Bailey (1982), Cordell & McKean (1986), Panayotou & Panayotou (1986), Bailey (1987b), Signey (1987), Kendrick (1988), and Pauly & Thia-Eng (1988).

[6]Kendrick (1988) observed that several fishers in a small fishing village in Masbate, Philippines, originally moved to the village to avoid armed conflict occurring inland. This form of migration is possibly a derivative of 'distributional displacement.'

[7]In some areas of Asia, technological displacement may have occurred on a significant scale in spite of the labour-absorbing effects of the Green Revolution. Boyce (1993) has shown that — on balance — the combined effect of the Green Revolution and farm mechanisation in rice agriculture in the Philippines has been displacement of labour. Similar trends have been observed in other Asian countries (Jayasuriya & Shand 1986).

has been a degree of unplanned adjustment in the Bay economy to the problem of overfishing.

These two cases do not necessarily demonstrate that non-fisheries livelihood options offer a better way to deal with overfishing than family planning. They do, however, demonstrate the need to know if spontaneous adjustments to the problem of overfishing offer more promise as a solution than previously thought.

Conclusion

Daniel Pauly has made a contribution to fisheries science by drawing attention to the damaging effect of growing human population on the long-term integrity of fisheries resources. He has made the important observation that the capture fisheries sector — unlike agriculture — cannot be made to produce more fish through mechanical or biochemical intervention.

Nonetheless, the concept of Malthusian overfishing suffers from a serious drawback. In the tradition of Malthusianism and neo-Malthusianism, Pauly's concept focuses on the poor as agents of environmental decay, with scant attention to the structural antecedents of poverty and high fertility. The concept gives disproportionate attention to physical rather than systemic agency in environmental degradation.

In spite of these weaknesses in Pauly's (1993) formulation of the problem of overfishing, he has clearly demonstrated elsewhere a thoughtful understanding of the need to consider socio-economic factors influencing human reproduction. For example, with regard to the problem of population pressure on fisheries, he has written: 'Because poverty is the root of an array of fishery-related and other socioeconomic problems, solutions to fishing problems will be forthcoming only when the central issue, poverty itself, has been resolved' (Pauly & Thia-Eng 1988). Pauly's future writings on the problem of overfishing would have greater theoretical rigor and would be more persuasive if they more consistently followed this line of reasoning.

If a workable theory of overfishing is to be constructed, it must: (l) avoid those tenets of Malthusianism and neoMalthusianism that are questionable; (2) take due account of the structural/systemic factors leading to overfishing; and (3) give attention to the specifically non-demographic factors underpinning the problem of overfishing.

Fisheries management in tropical developing countries would be well served by a cogent theory of overfishing focussing on the human dimension. For lack of such a theory, we run the risk of treating symptoms as causes and of not getting at the root of the problem. In order to create a well-grounded theory, research must be conducted on the relative significance of social and economic factors leading to overfishing, and on the causal relationships among these factors.

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Co-operative fisheries management: Major changes in training required for government fisheries personnel

*by R.E. Johannes**

This article is condensed and adapted from Johannes, R.E. (in press), entitled ''Management Objectives Research and Extension Programs for Cooperative Management of Tropical Small Scale Fisheries'. **In**: *Proceedings of the International Workshop on Traditional Marine Tenure and the Sustainable Management of Marine Resources in Asia and the Pacific. Marine Studies Programme, University of the South Pacific, Suva, Fiji.*

Conventional fisheries management methods have worked very poorly in the industrial fisheries for which they were originally designed (e.g. Hilbom & Walters, 1992). Government managers of tropical small-scale fisheries operate under conditions where such methods are even less useful. Typically they involve the collection of far more data and much more centralised government control than is either practical or economically justifiable in most such fisheries. Not surprisingly, therefore, they are failing.

Accordingly, there is growing interest in the potential of decentralised, village-based management, especially in areas where customary marine tenure (CMT) facilitates local control of fishing activities. However, such management will not be effective if villagers do not possess adequate biological information on which to base their management decisions. The introduction of commercial fishing, the rise of trochus, bêche-de-mer, green snail and pearl shell as important exportable resources, and the introduction of new fishing gears and faster boats have all brought new management challenges with which traditional village-based management arrangements were not designed to cope.

Villagers may thus not understand the need for certain types of management. Or, if they do, they may not know how to formulate management plans to address that need effectively. Government fisheries personnel, in contrast, may not understand villagers' practical knowledge concerning their marine resources or management regimes.

What biological research objectives and management options are practical under the circumstances? The literature on CMT, extensive though it is, provides us with little guidance. This is because most of it has been written by social scientists. They have done an outstanding job of bringing to the attention of fisheries managers the nature and significance of CMT and the importance of factoring socio-economic considerations into marine resource management plans. They have taught that culturally and socially insensitive approaches will probably fail.

But so, too, will approaches that do not re-orient the basic biological thrust of research and management in these fisheries. Social scientists can hardly be expected to help us here. Fisheries biologists and managers, it goes without saying, have to do this for themselves.

Many fisheries managers agree in principle that what is needed is more emphasis on co-operative management. It seems clear, however, that to be effective, such a shift will have to be accompanied by major changes in training for, and design of both fisheries research and extension work.

Optimum or maximum sustained yields are objectives well beyond grasp in the great majority of tropical nearshore fisheries. But there is a practical, if less theoretically elegant and quantitatively rigorous alternative: the prevention of serious overfishing. This is a highly desirable and realistic goal for those involved in the co-operative management of such fisheries. Here I want to examine the kind of training and research needed to enable fisheries researchers and managers to take better advantage of the opportunities that co-operative management provides for preventing serious overfishing.

Villagers in a number of Pacific Island countries are exploring controls over a wide variety of marine resources without adequate technical advice. Closures are being implemented at an unparalleled rate (in this century at least) in connection with individual species, groups of species, or entire sections of shallow-water fishing grounds. The speed and variety of village-based management experiments of this sort is especially impressive in Vanuatu (Johannes, 1994). Other examples can be found in the Solomon Islands (Hviding, 1992, 1993), Palau (Johannes, 1991), the Cook Islands (e.g. Sims, 1990) and Fiji (Fong, 1994).

Village fishers are strategically placed and highly motivated to judge the effects of their management measures, and often quite willing to modify management as their knowledge of its effects improve. But some important aspects of the life histories of target organisms are unknown to them. For ex-

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ample, they have little idea of how fast target species grow and thus have only hazy notions of how long a closure would be effective as a conservation measure.

In addition, some principles of fisheries management cannot easily be learned simply through experience on the fishing grounds. For example, unless it is explained to them, fishermen are unlikely to be aware that decreases in catch per unit of effort or in the mean size of individuals in the catch are not necessarily signs of overfishing. Clearly they could benefit from advice on a wide range of subjects. How can island fisheries departments improve their efforts in this regard?

Re-designing fisheries extension work

Fisheries extension work throughout the tropics has focussed largely on fisheries development. But for the purposes of co-operative management a supportive extension programme must incorporate different skills and knowledge. Extension workers must learn how to obtain information efficiently on village marine management strategies and on practical local knowledge concerning marine resources. They must also learn how to provide the complementary biological knowledge and education that villagers need in order to manage their resources better. Villagers want answers to questions such as 'what management measures are there for us to choose from, and where, when and for how long should we apply them?'.

An appropriate extension programme must, moreover, be concerned not only with transferring technology and explaining conservation to villagers; it must also be concerned with explaining village fishermen's customs and knowledge to government fisheries personnel.

Learning how to carry out the appropriate interviews, discussions and other activities with fishers requires training that is not normally a part of a fisheries biologist's curriculum. Such training should be made available not only to fisheries extension officers, but also to those who supervise them.

Data-less management and the value of qualitative information

Unfortunately some fisheries researchers are not predisposed to think about what is, to them, the unthinkable — that is, data-less management. Their efforts to improve their research performance tend to focus narrowly on designing more quantitatively rigorous biological data-gathering programmes. But data-less management need not be information-less management. One doesn't need data to protect a spawning aggregation or a giant clam population that fishermen agree is badly overfished.

When biologists and fisheries managers fail to act under such circumstances because scientific proof of depletion is unavailable, and if village authorities cannot cope by themselves, severe depletion is often inevitable. Indeed, examples of severe depletion and even local extinctions are cropping up with increasing frequency in tropical nearshore fisheries. Many of them could probably have been prevented if fisheries biologists had just listened to fishermen, and helped establish village-based controls.

To be sure, there is a great deal of lip service being paid to the value of local knowledge these days. But little effort is being made to actually record (let alone act on) it. Why is this? At least in part is because fisheries researchers are not taught to seek knowledge from people; they have been trained to go first to books, then directly to nature for their answers. This has to change, and appropriate training is essential in order to change it.

Questionnaires are sometimes used, but these can be a real barrier to effective communication (Johannes, 1993). Questionnaires addressed to randomly selected fishermen are fine for obtaining some types of valuable information. But they are quite inappropriate for the study of local knowledge about marine resources. Information provided by expert fishermen is, not surprisingly, more useful in many respects than that from average fishermen.

In some countries with high birth rates and very youthful populations the average fishermen will be in their mid-twenties. Such youngsters are not likely to know much about changes in fishing conditions that have occurred over the past 50 years, nor about fishing in general, compared to their elders — some of whom are too old to fish any more and thus have no chance at all of being interviewed during a random sampling of fishermen. The brainwashing we have received from narrowly trained and dogmatic teachers, entranced by the theoretical appeal of statistical analysis of data generated by random sampling, has tended to blind many of us to the virtues of other approaches.

Here again we see the need for more appropriate training. It is wrong, by the way, to denigrate local marine knowledge by saying that fishermen will always tell you that fishing is worse than it used to be. (How many times have we heard ourselves or

our colleagues make that careless assertion?) Many old-timers in Vanuatu told me that fishing had got better because of their new management regimes. Similar assertions have been made recently by villagers with new marine resource management regimes in Palau (Johannes, 1991) and Fiji (Fong, 1994).

Research in support of village-based management

The value of experimental marine resource management research is increasingly recognised (e.g. Alcala & Russ, 1990; Sainsbury, 1982; Hilbom & Walters, 1992). Conventional fisheries management requires gathering data on catch, effort and stock sizes literally endlessly, while formulating management principles based on extrapolations from this data. Experimental management, in contrast, is an iterative, pragmatic process involving the testing of various strategies on the fishing grounds and the basing of future decisions on the results.

We refer to this process by the unglamorous term 'trial and error'. The 'trial' in trial and error implies taking action now, rather than delaying until after years of data collection. It is the procedure used to arrive at most important decisions by our species. But the process has been wrongly denigrated by many scientists in this century because of the superior decision-making strategy of scientific hypothesis-testing *when it is applied to a limited range of important issues* — not, I would stress, including marine resource management.

Taking action now is vital in seriously declining fisheries. But it often makes conventional fisheries biologists very nervous, because the huge quantities of data needed to fine-tune management according to their criteria are rarely available. They are *never* available, moreover, in complex multispecies fisheries characterising the nearshore tropics. In fact, the dynamics of such fisheries are so poorly understood that no one would recognise the necessary data if they were delivered to them in a gold-plated hard drive.

Unfortunately, very little experimental management research has been done; opportunities have been few because it is hard to find, or establish, suitable experimental conditions and controls. But the restricted size of many managed village fishing grounds and the management control afforded by CMT and traditional authority make them exceptionally attractive for this purpose. Vanuatu's village marine resource management systems provide such conditions in what may be unparalleled in number and variety (Johannes, 1994). Some similar opportunities appear to exist in Palau (Johannes et al,.1994) and Fiji (Fong, 1994). A major purpose of such work would be to extract conclusions generalisable to other, similar local fisheries.

Simple before-closure-and-after surveys of species abundances would be very useful, although many other valuable research projects are conceivable under these conditions. We might examine certain plausible indigenous conservation measures, the efficacy of which seems never to have been studied by researchers, such as the widespread banning in various Pacific Islands of night spearfishing and of gillnetting. Other approaches to village-based management worth further evaluation include fishing reserves (e.g. Alcala & Russ, 1990) and the control of fishing on spawning aggregations (Johannes, 1980, 1991).

Studies of effects of experimental management on bêche-de-mer stocks are badly needed (e.g. Preston, 1993) Research on the effects of closures of varying lengths on finfishes, rock lobsters, mangrove crabs, green snails, trochus, giant clams and other species that are important in large areas of the tropical Indo-Pacific would also be of particular value.

Many of these experiments are now being performed — by the villagers; all we have to do is show up and measure the results! Local management systems in some villages even offer researchers useful spatial as well as temporal controls; for example, when one half of the village's fishing ground is closed, the other half (sometimes with virtually identical habitats) is open (e.g. Johannes, 1994).

Village-based fisheries management systems appear to offer so many opportunities for experimental management research that overseas as well as local researchers should be made more aware of them. Indeed, overseas researchers will probably *have* to get involved if full use is to be made of the opportunities afforded by these systems without overtaxing the resources of fisheries departments. I am confident that many villagers would welcome such projects in their waters if they were presented to them and carried out with appropriate sensitivity and in a genuine spirit of collaboration.

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Some background notes on a successful fisheries management study at a remote Micronesian atoll

by Andrew Smith* and Paul Dalzell**

During April and May 1991, we conducted a series of fish stock depletion experiments on the back reefs of Woleai Atoll, Yap State, Federated States of Micronesia. The objectives of this study were to obtain contemporary information on catch rates by traditional community fishing methods, identify the principal target species in the catch and estimate the standing-stock biomass of the fishable stock. Two types of community fishing methods were employed in this study, leaf-sweep drive-in-net fishing (known locally as *roop*) and group spearfishing (known locally as *gapiungiupiung*). Both methods employ between 30 and 40 men working in a group to catch large volumes of shallow-water reef fishes.

Both types of fishing are common throughout Micronesia and the insular tropical Pacific but have not generally been studied in detail. Further, these co-ordinated types of fishing lend themselves to stock depletion experiments, where intensive fishing conducted over a short time period in a limited area should result in a noticeable decline in catch rate or catch per unit of effort (CPUE). The rate of decline in CPUE is proportional to the initial biomass, so a plot of CPUE on cumulative catch can be used to estimate the original population size in numbers and weight. If the area fished is known, the biomass can be expressed per unit of area (e.g. kg/ha or t/km^2). The total biomass on a reef can then be estimated from the product of the relative biomass density and the total habitat area.

This project was very successful and four stock depletion studies were conducted at Woleai Atoll. The results were later documented and published as Inshore Fisheries Research Project (IFRP) Technical Document No. 4 in 1993 (available from the South Pacific Commission, B.P. D5, 98848 Noumea Cedex, New Caledonia). Standing stocks of shallow-water reef fishes, mainly surgeonfish and parrot fish (Acanthuridae and Scaridae) ranged from 5

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to 25 t / km^2, with a mean of 12 t / km^2. Differences in biomass density were possibly linked to the history of community fishing on the different reefs, with the lowest densities on those reefs fished most recently. Besides the stock depletion study, we also collected information on catch rates by other gears, simple biological observations on the fishes in the catch, and information on the numbers of fishing gears and vessels on Woleai.

The Woleai project was conceived as a result of a chance conversation between the two authors. One us (Smith) was explaining, with the assistance of some photographs, a traditional fishing method involving a leaf-sweep which was recorded during his study of traditional fishing methods in the outer islands of Yap State, Federated States of Micronesia. Dalzell suggested the possibility of using such a method for intensive (depletion) fishing experiments to gain an estimate of fish standing stocks. It took two years from this chance conversation until the project was successfully completed.

During the project's development Dalzell was a Fisheries Scientist with the South Pacific Commission. Smith had just completed two years in the outer islands of Yap State recording traditional fishing and management techniques, and had recently been employed as Adviser to the Yap State Government's Marine Resources Management Division.

After further correspondence to clarify our ideas, the next step involved securing approval in principle from the council of outer islands' chiefs, during one of their biannual meetings in Yap, to proceed with the project. No objections were raised at that meeting and so we continued with the project planning.

The next hurdle was to obtain funding for the project. Considerable effort went into explaining and justifying the project proposal to both the Yap State Legislature and the South Pacific Commission. After those two bodies approved funding for the project, official requests to the specific atolls were made through the council of chiefs. Although this is the official procedure, it had a number of inherent problems. Often, what is discussed with a chief or chiefs at the council meetings in Yap only gets back to the island in an incomplete form, if at all.

This can result in rumours which can have a lasting effect on the project. To overcome this, in addition to meeting with the chiefs and discussing the project with them, specially written explanations of the project's aims, needs and benefits were provided in the vernacular. Immediately after the council meeting, discussions were also held with outer island government officials, who, once they understood the purposes of the project, also advised those living out on the islands about it. One of the keys to the success of the project was explaining the aims, needs and benefits of the work to as many people as possible, for as long as possible, to ensure that they understood what it involved.

One of the hardest tasks was explaining to the chiefs, reef custodians and fishermen why we wanted to fish in the same place, with the same method, on successive days with the aim of catching less fish each day. The fishing methods we proposed to use are normally used in the same area only once or twice a year to get fish for a special occasion or for community use. To obtain permission to conduct this 'strange' style of fishing we had to satisfactorily explain:

1. How much area we would require;

2. Why we wanted to fish-out an area;

3. What benefits they would see from the project;

4. How much manpower we would require; and

5. If they would be paid.

Due to considerable logistical problems related to the remoteness of the Yap outer islands, our initial proposal to fish on two atolls, one that had been heavily fished and one that was rarely fished, we had to alter our plans and work only on one atoll, Woleai. Upon arrival at Woleai for the field work, a meeting was held with all the men on the main island and representatives of those from the other inhabited islands within the atoll. The whole project was explained step by step, and any questions answered and problems resolved.

The specific forms of the fishing methods we preferred were discussed and agreed on, and once the people fully understood our requirements, they determined how many men would be required and the most appropriate locations to conduct the fishing. After this meeting the project progressed without any problems. Without their complete understanding and co-operation, it would have been impossible to keep 40-plus men from five separate islands in the atoll working five days a week for four successive weeks.

A number of factors contributed to the success of the project, not the least of which was luck! We had four weeks of virtually ideal weather conditions.

Only once did we have some bad weather, and that fell on a weekend. Familiarity with the fishing methods, how they are usually conducted, and what minor alterations were needed to satisfy the scientific objectives was also essential to the project's success. This was achieved because of the familiarity with the island's culture and fishing methods acquired by Smith during the traditional fisheries project. The fact that Smith is married to a woman from Woleai probably also contributed to some degree to the co-operation we received.

Payment of the fishermen, hiring of the necessary boats, and provision of outboard motor fuel for the time spent fishing ensured the men's continued interest. Payments were made after the completion of work at each of the four fishing sites. Prior to the field work, considerable time and effort was put into ensuring that the fishermen would be paid in cash, rather than the usual government cheques which can take months to be issued.

After the project was competed and the report prepared, copies were sent back to the council of chiefs and to Woleai Atoll. On subsequent visits to the atoll Smith has continued to answer questions concerning fisheries management posed by the chiefs and fishermen.

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Traditional fishing on a Polynesian atoll

by Michael D. Lieber*

Abstract

Field research on the organisation of traditional fishing activities on Kapingamarangi, a Polynesian atoll, shows that homeostasis in this marine ecosystem is an outcome of how the constraints on fishing activity are mutually ordered. Even a very simple technology that uses only local resources can generate hardware and techniques that are capable of wiping out whole species of fish. It is how fishing methods are sequenced that prevents potential devastation, and this depends on the human institutions that control the sequencing. These institutions are designed to cope with environmental conditions as they are perceived by the local human population. Change either the local perceptions or the local institutions, and the ordering of constraints on fishing activity change. This is what makes the difference between homeostasis and ecological (and social) chaos. The idea of sustainable technologies is useless if it includes only hardware. It must also include the organisation of deployment, the institutions that implement that organisation, and the cultural patterns of perception that shape the institutions.

An atoll is one of the most marginal human habitats on earth. Pacific atolls support only 50 to 100 plant varieties, and of these less than a dozen are edible. Coconut and pandanus trees are almost everywhere, and maybe also arrowroot and edible creeper. Breadfruit and taro grow only on those islets—strips of land perched on the lagoon side of the reef—wide enough to support a ground-water lens, since the only source of fresh water is rain. The only native mammal is the rat. From this skimpy resource base, people have to make their living.

When disaster—typhoons, red tides, droughts—strikes, there isn't much to fall back on unless there are other islands nearby that people can flee to for refuge. Most Pacific atolls are fortunate enough to have been parts of regional interdependent clusters from time immemorial. The Polynesians of Kapingamarangi Atoll in Micronesia weren't so lucky. This tiny atoll with less than half a square mile of land area was one of the most isolated islands in Oceania until colonial contact in 1877. Kapinga people were left alone to survive as they could for most of their 800-year history.

The land supported taro, breadfruit trees (for food, canoe hulls, cordage, and clothing), coconut trees (food, drink, baskets, thatch, and house posts), pandanus (food, thatch, mats, canoe sails), hibiscus (cordage, loin-cloths), a few varieties of hardwood for construction, and coconut shells for bowls, fuel and small fish hooks. The lagoon and deep sea

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provided shell for fish hooks, knives, adzes, scrapers, drills, abrasives and food—the only source of protein. That was all there was before Europeans arrrived: but it was enough. What made it enough for Kapinga people was their knowledge: 'knowing what they could do with what they had.'

My job in research on traditional fishing was to find out how Kapinga organised knowledge (about fish and their habits, about the reef, lagoon, deep sea, tide patterns, wind patterns, and the ubiquitous spirits that comprised the fishermen's environment), and how they put that knowledge into practice in their catch techniques. I was seeking to understand the indigenous organisation of a human ecosystem as seen from the inside.

Kapinga's 85 traditional catch methods were variations of just seven kinds of techniques: netting, hook-and-line attached to a pole, hand-held hook-and-line done from a canoe (angling), trapping, use of weirs, reef collecting and diving for clams. Netting, done mainly in groups of men organised through a communal men's house under a headman, was the mainstay for feeding the population. Netting groups provided not only food, but also the context in which young boys learned and tested their skills and came to understand the meaning of teamwork, discipline, quick response and masculinity.

Angling was the most prestigious kind of fishing, but canoe ownership was limited to a minority of adult men by the high priest, who owned all of the breadfruit trees and who had to initiate canoe-building with the proper ritual. All other techniques had much less prestige than these two (except for bonito fishing with a pole and line) and were used seasonally.

Which technique a fisherman used on a given day ultimately depended on two major environmental variables: winds (with their associated tide patterns) and the activity of powerful spirits in the deep sea and the lagoon. During the October to May windy season, strong northeasterly trade winds made the lagoon and most of the deep sea too choppy for Kapinga single-outrigger canoes, leaving only small lee areas of calm waters to anglers.

The fish available in these places were limited by what kinds of bait fishermen could obtain. So, for example, if hermit crabs were the only available bait, fishermen could angle for triggerfish and varieties of sea bass that would take crab. Once some of these were caught, they could be cut up for bait, allowing fishermen to move to deeper waters for jack fish, but all this only if the currents were not too swift.

The trade winds also brought higher tides (up to 4–5 feet) during the day and only one low tide in the evening or at night. This limited netting methods to those that could be done on the outer reef by day, and in the channels between islets from the lagoon shore in the evenings. Netting in groups involves surrounding an area with from 15 to 40 men and driving the fish toward a waiting net or trap. Depending on the fish and the area, the fishermen could use either a 'sledge hammer' or a 'finesse approach'.

For example, with a four-foot high tide on the outer reef, fishermen could fan out from the purse net (attached at each end to big coir nets) up to a half mile and slowly ease the fish toward the nets by gently sweeping the water in front of them with punting poles. This method gets only larger fish, since the smaller ones hide in coral heads and rubble as the fishermen pass by.

Once the fish are at the purse net, the ends of the coir nets are closed behind them to prevent escape. Then the noose is tightened to push fish with the purse net,whose draw strings are pulled to close them in. A variation of this method is called 'coconut leaf netting', because instead of punting poles, fishermen surround the area with long lengths of connected rope with coconut leaves tied to them every five feet or so. Because all of the fish run from the leaves, this method clears the reef of fish, and it is a windy season mainstay.

The sledge-hammer approach takes time to set up, mostly to carefully position the fishermen and the net or trap. Once it starts, it is inter-islet channel, and dirty, scaring the fish out of their wits and giving them no time to look for escape routes. A reliable windy season example is catching small reef fish as they feed around the channel between islets in the evening low tide.

One group of men surrounds the fish in the lagoon around the fan-shaped area of sand created by water that flows from the ocean to the lagoon. They beat the water with paddles, driving the fish toward the sand spit on one of the islets, where another group of men (forming an arc across the channel to the opposite sand pit) beat the water to keep fish moving across the channel.

Inside the arc is an area of swift-flowing deep water. Fish will not go there for fear of predators, so the fishermen form a gauntlet forcing the fish to the opposite beach, where a trap with two attached nets awaits them. As the fish pass, fishermen follow them, beating the water behind them to prevent their turning back. The men push the fish into the trap.

Calm season from May until September opens up the lagoon, reef and deep sea to every technique in the repertoire, and a single fisherman often finds himself going on two or three different fishing expeditions in a single day.

For example, at the new moon, a young man might find himself conscripted to paddle the canoe out beyond the reef at night while his elders are torch-fishing for flying fish. He will probably get his turn with the torch in one hand and the flying-fish net in the other. With plenty of fish, the men may decide to test for rainbow runners, so the young man will be busy cutting and chewing flying fish to bait hooks for eight-fathom lines.

If the test is successful, the men will stay on the water until the canoe is loaded. It will reach shore just in time for the young man to be conscripted by yet other men preparing lengths of coir net to stretch across an inter-islet channel to block the return of goatfish and rabbitfish from the reef to the lagoon.

After they collect the fish in the trap set on one of the sand spits, the young man might manage to slip away for some sleep, unless he is unlucky enough to be spotted by another group going to the outer reef to net schooling spinefoot by blocking their path to the big reef channel (to breed). Even if he manages to avoid these men, there will be work waiting for him by mid-afternoon, when a 14- to 18-inch high tide on the reef is perfect for 'netting at the rock piles'. Fishermen surround large piles of rock placed on the inner and outer reef flat and, beating poles or paddles on the water, drive the parrotfish, trevally, and other reef feeders into these rock piles.

Then the fishermen surround the rock pile with a coir net while one or two men working inside the net pull the pile apart, putting the rocks on top of another coir net laid beside the pile. Fish escape to this pile, and when the first pile is gone, the ends of the net are lifted up, the rocks inside discarded, and the fish inside put into a canoe. Fishermen work three to four of these rock piles in an afternoon, unless someone spots a school of rainbow runners beyond the reef.

Then the men's house group will abandon the rock piles and gather at the men's house to organise a rainbow runner surround. Up to 40 men surround the fish in deep water off the reef with connected coir nets, slowly easing them to a place on the reef that is clear enough to get them to swim over the reef margin and onto the reef flat, where the net can be closed around them. The entire operation is directed by the men's house headman from the reef using hand signals. If rainbow runners spook, they'll fly out of the water at terrific speeds, and their hard beaks can maim or kill a fisherman.

Our young get little sleep for about three days, after which the tide patterns change and the two high and two ebb tides occur later in the day with a different ebb and flow, opening up yet other netting techniques.

But this can all change suddenly and radically if yellowfin tuna appear. Once this happens, the only canoes allowed on the water are those used by tuna fishing crews—and these are limited by the number of old men who know and can use the proper chants to the gods of the deep water.

If the young man has not been selected to work on a tuna crew, then the only fishing he will do is netting and pole and line that can be done without canoes, such as walking the reef at low tide, turning up rocks and catching hiding fish in a hand net; helping in a surround of a coral head at a lagoon beach or walking to the outer reef with a group, surrounding fish feeding in a tide pool and frightening them into a waiting net. The lagoon and deep sea belong to the tuna crews for bait and tuna.

Tuna season is critical to this community, because the tuna caught during these four to six weeks will be processed into jerky to tide people over during the relatively poor catches of the windy season, which Kapinga call 'the hungry time'.

Tuna season also presents fishermen and the community with palpable danger—not only do fishermen have to be careful with the six gods of the deep water, but they also have to cope with the possibil-

ity that another set of gods that sleep in the cult house by night, leave the atoll in the morning, and return to sleep in the early evening, might suddenly decide to change their routine and return early in the day.

Whereas the deep-sea gods can be mollified if dealt with properly with ritual chants and careful circumlocutions by the canoe crew, the other gods are unpredictable, whimsical and gratuitously nasty. They refuse to be seen, so they change shape by taking the forms of rays, whales, or sharks when they make unscheduled returns. It's up to the most knowledgeable fishermen to determine when a shark is really a shark or really a god and to be prepared with the proper ritual of appeasement.

This is why tuna crews must have old men to lead them. If the shark is really a spirit, then the crew has to signal other canoes to return to shore, notify the high priest, and wait for him to use ritual means to determine when it is safe to go out again. That may take several days. These dangers were always present in the old days, but they were intensified during tuna season because so many canoes were continually out on the deep sea and a lost day of tuna fishing meant hunger during the windy season.

Tuna canoes are named and kept in a special enclosure on the beach during the tuna season. Crew members abstain from sex and frivolity, and crews work together out on the water.

Fishing begins with chumming—chewed and chopped pieces of bait in a breadfruit leaf package weighted by a rock and wrapped with fishing line are lowered to a 60- to 90-fathom depth and opened by jerking the line so that it unravels and lets the rock drop out and the package open. After several packages have been dropped, fishermen bait their hooks and angle at a uniform depth, usually starting at 60 fathoms and moving deeper as needed.

On the first days of fishing, canoes form a line, catching the tuna as they swim by the line. This procedure accustoms the tuna to finding food in a single place. When they return to that spot, the canoes circle to drop their chum, trying to get the tuna to swim in a circle where more of them can be caught. Fishermen continue this daily until the catches are small. At this point, the season is declared over by the high priest, and other anglers are allowed to take canoes out for a few days of tuna fishing, but each canoe is allowed only two tuna.

Tuna (and other deep-sea) fishermen's favorite bait was a kind of sardine that was caught at weirs constructed between islets seaward of the inter-islet channels. Long-sided, V-shaped weirs with their open ends facing the lagoon and their opposite ends almost touching at the ocean side, caught the sardines at a rising tide as they swam from the lagoon to the reef.

All it took was a net placed over the small opening at the seaward end of the weir and hand nets to scoop up the trapped sardines. These weirs were laid end to end in a zig-zag pattern and a smaller, diamond-shaped weir built at the lagoon ends of the big weirs for catching sardines as they returned to the lagoon at ebb tide. Kapinga also used goatfish weirs on the inner reef and two other kinds of weirs on the outer reef flat, all for calm season fishing.

Traps are the lazy man's way of getting lots of fish, and Kapinga use several different kinds. One of them, a rectangular box with an opening and a trap door, baited inside with hermit crab or even coconut, is simply placed in two or three feet of water close to the lagoon beach and covered with rocks, leaving only the mouth of the trap uncovered and the trap looking like a small coral head. Fish enter the mouth looking for the bait and get trapped.

Other fish go in after the fish that are already there, and, after two or three days, the fisherman retrieves a trap loaded with small reef fish, empties, re-baits and replaces the trap, and comes back in another three days (or until bad weather, when the lagoon is murky and fish won't enter the trap).

Another trap identical to this one, only four times larger, is baited with starfish and left weighted down in the rocks of the main channel that cuts through the reef. This one, called 'the stinky trap' because of its bait, fills up with large fish such as the giant grouper, the giant snapper and jack fish. Kapinga use a small, flat trap set near the currents in the inter-islet channels for white reef eels and another, oval-shaped trap for moray eels.

The moray eel trap is set on the outer-reef slope in the rocks where these eels make their homes, baited with crab or octopus, weighted with clam shells, and left for two or three days. An abalone shell is tied to the top of the trap so the fisherman can spot the trap from the water surface. Traditionally, the only men who could use the eel trap were those who knew the ritual that initiated it, and this ritual was a closely guarded secret. Moray eel was and still is the quintessential feast food.

Trapping and lagoon angling can be combined, for example, in fishing for sea perch. Fishermen rarely catch a lot of sea perch at one time, and the few who

do get a lot are the lucky ones who know a secret spot on or near a deep-water coral head where these fish congregate. A fisherman will test his spot with a baited trap weighted with rocks and lowered to the right depth. A line with a small stick for a float locates the trap, and the fisherman takes off so as not to let others know what he is doing.

Meanwhile, any fishermen nearby will watch him like hawks trying to locate his spot. It's a tricky game. When the fisherman thinks no one is watching, he'll go back and check his trap. If it has enough sea perch inside, he baits his hook on a hand line and angles, going back each day over a five-day period as catches get larger, until the fish run out. He can do this once a season for each spot.

Collecting on the reef and diving for clams are calm-season activities. Women do most of the collecting on the reef, mainly looking for sea urchins. This is a chance for them to get away from their houses and socialise with their friends as well as providing food and spines (which men use for smoothing wood). Diving for clams is a fall-back catch method when nothing else is productive or when people have a yen for clam meat. The diver carries a knife to cut the muscle that holds the clam shell shut, cuts out the meat, and retrieves the giant clam shell, which fishermen use for adze blades and hooks.

Wind and tide patterns determine what kinds of fish are available on a given day, but it was the spirits that determined whether or not a fisherman had access to them. Jealous of their turf and their perks, spirits would punish even the most unintentional of slights by with-holding fish, by killing the fisherman, or by bringing drought or gale winds.

Fishing was always risky, but spirits made it downright dangerous. A mistake on the water could mean mass starvation on land. Fishermen coped with these dangers using ritual chants of appeasement and metaphorical speech to keep a predictable but low profile. Only older, experienced men could be trusted to assess dangerous situations and to deal with the spirits on the water. Only the high priest could communicate directly with the spirits to ascertain their wishers.

This is why the high priest controlled access to canoe ownership and showed preference to men trained as priests in granting new canoes. This is why access to the reef and designated areas of deep sea was restricted by age grading. This is why the high priest controlled access to the lagoon and the deep sea and why he had to be in constant contact with men's house leaders. This is why the temple and the men's house—the two institutions that organised the community—organised traditional fishing activiity.

Wind and tide patterns combined with the activity of spirits continually transform the lagoon and deep sea, the reef and the beaches, the coral heads and the channels from one sort of fishing spot into another sort. These constant transformations of the ecosystem meant that fishermen continually shifted attention from one variety of fish to another.

Over a year, catch activity was spread evenly over 200 indigenous varieties of fish, with none of them being exploited to the point of threatening their numbers. Traditional fishing activity, in other words, was a self-sustaining system, despite the fact that conservation was never a goal of fishermen. Indeed, Kapinga fishermen were and still are maximisers who will take every available fish on any expedition, limited only by how many they can transport home.

If I have given the impression that Kapinga fishermen did not have technology to wipe out fish populations in their traditional repertoire, I have to tell you that this is only partially true. They did have at least one method, mentioned above, that was capable of wiping out the breeding stock of one sea bass and two spinefoot species.

Three days before the new moon, during the four months of calm season, a particular variety of sea bass schools on the outer-reef flat in the early morning and moves clockwise around the reef toward the main channel in the southeast quadrant of the reef, where it breeds.

For three days following, rabbitfaced spinefoot do the same, and for the following three days another spinefoot variety migrates over the reef. Using the method of blocking the path of these fish with a net, fishermen get every one of them.

Assiduous practice of this method every day of this nine-day period throughout the calm season could have eliminated these species within two or three years. The reason that it did not has nothing to do with the technology. It has to do with how the constraints on the use of the technology occurred.

A day of heavy rain prevented the use of this method because a rain-soaked sail was too heavy to manoeuvre, eliminating the possibility of getting to and transporting the fish. An early spotting of rainbow runners would prevent this sort of netting as the men went after the rainbow runners.

Because of other options (e.g., angling and other netting expeditions,) it was rare that any men's house could assemble the requisite men and canoes for more than one or two days out of three. If tuna were in season, this method would not be practised at all. Since the tuna season occurs in the middle of the calm season, that means that there are at least two lunar months in which these fish proceed unmolested to the channel.

It was precisely these three species of fish that were being threatened with extinction in 1980, not by netting, but by the use of a light, hand-held spear gun deployed in the channel as they entered (ironic, since the net is far more efficient than a single fisherman with a tool). What makes this technological change so devastating is not its efficiency, but the organisation of its deployment. A single fisherman can get 75–100 fish, and several fishermen together multiply the catch.

Without other constraints, they can continue working till the fish run out. By 1982, the constraints on fishing activity had changed radically. The traditional hierarchical ordering of constraints (with wind and spirits at the top, followed by a nested set of ritual constraints exercised in turn by the high priest, the men's house leaders, and their lieutenants, with specific environmental constraints such as bait, tide pattern, etc., at the very bottom) was long gone with conversion to Christianity.

Changes in the relationship between the atoll and its colonial masters and the organisation of authority in the atoll social order had robbed the men's houses of their organisational power. The organisation of fishing activity had shifted from control by institutions to control by individual fishermen over their own decisions and resources. The adoption of outboard engines affixed to outrigger booms made access to any part of the lagoon or deep sea quick and easy (and expensive). There are no longer any constraints on fishermen's activities other than bait, the weather, and the gas supply. This is why these species are threatened.

I have condensed a much larger argument and its substantiation into a very small space and have glossed over cultural ordering of this human ecosystem and its processes of change. You will find a complete account in my book *More than a living: fishing and social order on a Polynesian atoll*, Boulder, Colorado: Westview Press. (1994).

TRADITIONAL MARINE RESOURCE MANAGEMENT AND KNOWLEDGE

RECENT PUBLICATIONS

Nearshore marine resources of the South Pacific: information for fisheries management and development

Nearshore marine resources of the South Pacific: information for fisheries management and development. Andrew Wright & Lance Hill (eds.) 1993. Published by the Forum Fisheries Agency, the Institute of Pacific Studies (University of the South Pacific) and the International Centre for Ocean Development (see below for prices). xvi, 710 pp., illustrations, maps, tables, bibliographies. Casebound only.

Fifteen years in preparation, this superb volume was well worth the wait! It deals with resources mainly of interest to village fishers. In 20 chapters the editors and contributing authors set out to compile the bulk of available information on the biology of each important near-shore resource in the South Pacific region. In so doing, and because the development and subsequent management of fisheries for these resources are a major component of each chapter, this publication goes a long way toward assisting national fisheries personnel in collecting and reviewing the plentiful information that is widely scattered in the scientific and general literature.

The publication will help focus attention on the increasing pressure to exploit near-shore resources commercially, which, if not properly managed, could lead to local extinctions. It will also help promote consideration of financial and manpower resources for rational fisheries management and conservation practices.

Nearshore marine resources of the South Pacific: information for fisheries management and development will surely become the single indispensable reference work for fisheries administrators and managers, researchers and students in the South Pacific as well as other tropical regions. The collective research is extensive and the bibliographies impressively comprehensive (for example Wright's bibliography for the chapter on 'Shallow water reef-associated finfish' covers 32 pages). As a short cut to accessing the vast and frustratingly scattered literature on small-scale fisheries in the South Pacific this book is a godsend!

The 20 chapters are as follows:

Introduction (Andrew Wright)

Appraisal, assessment and monitoring of small-scale coastal fisheries (John L. Munro & Semisi T. Fakahau)

Coastal fishery resources management (John L. Munro & Semisi T. Fakahau)

Deepwater demersal fish (Robert B. Moffitt)

Small pelagic fishes (Paul J. Dalzell)

Marine aquarium fish (Richard L. Pyle)

Flyingfish (Robert Gillett and James Ianelli)

Shallow water reef-associated finfish (Andrew Wright)

Sharks (Paul V. Nichols)

Marine turtles (Harold F. Hirth)

Beche-de-mer (Garry L. Preston)

Pearl oysters (Neil A. Sims)

Giant clams (John L. Munro)

Trochus (Warwick J. Nash)

Green snail (Masashi Yamaguchi)

Deepwater shrimp (Michael King)

Spiny lobster (C. Roland Pitcher)

Mangrove crabs (Ian W. Brown)

Coconut crabs (Warwick J. Fletcher)

Seaweeds (G. Robin Smith)

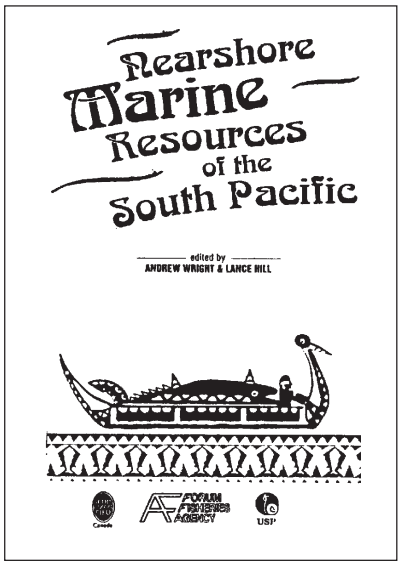
Ordering information: Purchase from either:

Forum Fisheries Agency
P.O. Box 629 - Honiara - Solomon Islands
Fax: (677) 23995

or

Institute of Pacific Studies
University of the South Pacific
P.O. Box 1168 - Suva - Fiji
Fax: (679) 30159

Prices (which include airmail postage) are USD25 when ordering from FFA member countries or USD45 when ordering from outside the Pacific Islands.



Customary aquatic and marine tenure in Papua New Guinea: a bibliography with extracts

Customary aquatic and marine tenure in Papua New Guinea: a bibliography with extracts. EWC Working Papers, Environment Series No. 36. Donald M. Schug (compiler) 1994. Published by the East-West Center. iii, 22 pp. (no price stated).

In Papua New Guinea (PNG) various kinds of customary tenure have played an integral role in people's lives, most likely for millennia. There is voluminous published and grey literature on customary land tenure in PNG, but that dealing with tenure over lakes, rivers, lagoons, and marine waters is less abundant. Schug's bibliography is a first attempt to catalogue the available English-language literature on customary aquatic and marine tenure in PNG.

For each reference included, selected passages on the key points about tenure have been extracted and cited in the original author' own words. If the reference is to a specific social group or geographical area, the relevant Province name is noted and related to a map provided.

The bibliography includes 88 references with extracts, culled from a wide range of governmental, academic and popular literature, most of which was located through a literature search at the Michael Somare Library of the University of Papua New Guinea.

The compiler acknowledges that the bibliography is incomplete and requests that he be sent additional items for inclusion in an updated version. Donald M. Schug can be contacted via the EWC Program on Environment, East-West Center, 1777 East-West Road, Honolulu, Hawaii, USA 96848.

If you want to order this bibliography, write to:

Publications
EWC Program on Environment
East-West Center - 1777 East-West Road
Honolulu
Hawaii USA 96848

Fiji fisheries bibliography

Fiji fisheries bibliography. Robyn McDowell (compiler) 1993. Published by Pacific Islands Marine Resources Information System (PIMRIS), University of the South Pacific, Suva, Fiji. iv, 191 pp. (no price stated).

Compiled at the request of the Fisheries Division, Ministry of Primary Industries, Fiji, the *Fiji fisheries bibliography* is an initial attempt to compile the available literature on the nation's fisheries. 1421 entries are included.

Entries include items pertaining to fisheries in the broad sense of the term and specifically to the geographical area of Fiji. Many items cited are unpublished reports and other 'grey literature'.

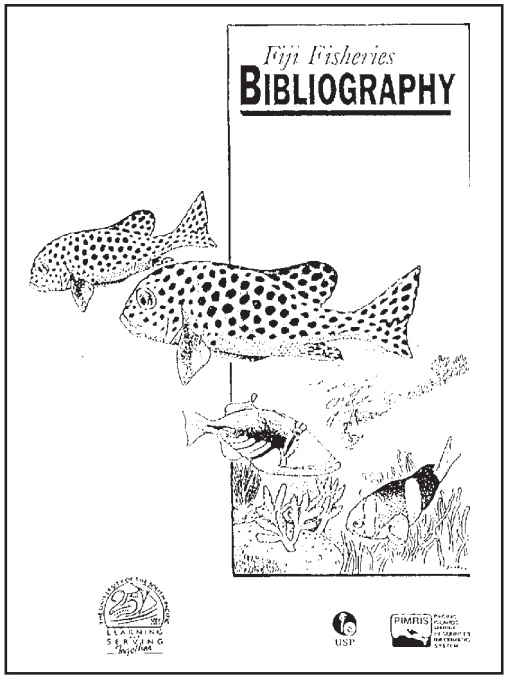
The main body of the bibliography is organised in broad subject groupings, based on the Aquatic Sciences and Fisheries Information System's *ASFIS Subject categories and scope descriptions*. An outline of the subject organisation is provided. There are two indexes: author and subject. The latter uses descriptors from *Aquatic sciences and fisheries thesaurus*, supplemented with common species names and concepts specific to Fiji.

Most citations have a location code (key provided) which shows where the item was sighted and verified. Items without location codes have not been verified.

The *Fiji fisheries bibliography* has been compiled as a database using CDS/ISIS software.

The database is being continuously up-dated as new items are brought to the attention of the compilers. Contributions of new or missed information, as well as purchase orders should be addressed to:

PIMRIS
University of the South Pacific Library
P.O. Box 1168 - Suva
Fiji



The Ray Parkinson Memorial Lectures 1992: marine resources and development

The Ray Parkinson Memorial lectures 1992: marine resources and development. G. Robin South (ed.). 1993. Published by the Pacific Islands Marine Resources Information System (PIMRIS), University of the South Pacific Library, Suva, Fiji. vi, 149 pp.

The Ray Parkinson Memorial Lectures are held at the University of the South Pacific approximately every two years.

They are intended to focus public attention on different aspects of development in the South Pacific and improve understanding of basic economic principles and their relevance to public policy-making.

All lectures are published in book form. Since the future of Pacific Island nations lies in the ocean and its resources, the lectures for 1992 focused on the development and management of marine resources.

The resultant volume comprises eight chapters, as follows:

An overview of living and non-living marine resources (Philipp Muller)

Managing fisheries resources: the Fiji experience (Ratu S. Tui Cavuilati)

Panel discussion on commercial fishing (Mitieli Baleivavualala)

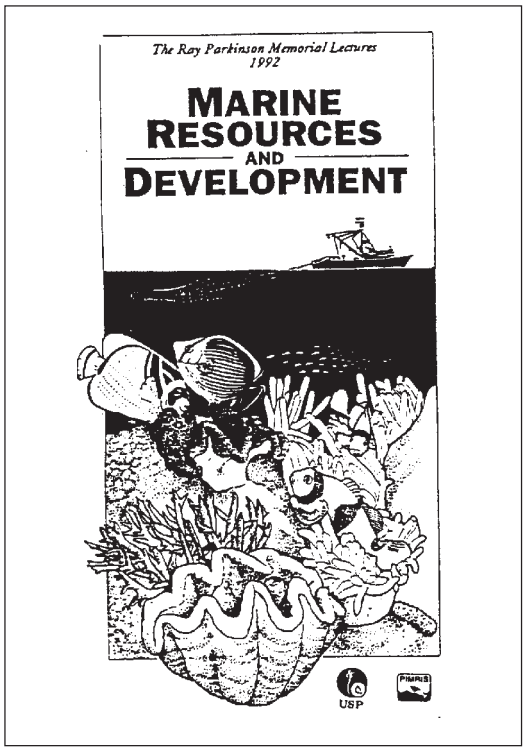
Commercial fishing (Robert Stone)

Village-level fishing in the Pacific (Joeli Veitayaki)

Aquaculture development, customary fishing rights and fisheries access agreements (Peniasi Kunatuba)

Women in commercial fisheries in the South Pacific: a focus on the situation in Fiji (Vina Ram)

Marine resources and development: a view of the future (Robin South)



Ordering information: Pre-paid orders should be sent to:

PIMRIS
University of the South Pacific Library
P.O. Box 1168 - Suva
Fiji

USD prices are: Pacific Islands and developing countries 5.00 (seamail) and 8.00 (airmail). Elsewhere 10.00 (seamail) and 15.00 (airmail).

The rural context of giant clam mariculture in Solomon Islands: an anthropological study

The rural context of giant clam mariculture in Solomon Islands: an anthropological study. Edvard Hviding. 1993. Published by the International Center for Living Aquatic Resources Management (ICLARM) and The Centre for Development Studies, University of Bergen. xiv, 93 pp., photographs, tables, appendices.

Based on field research in various locations in Solomon Islands, supplemented by a review of literature and archival sources, the social and cultural parameters typically relevant to village-based giant clam mariculture development in the Pacific Islands region are examined. The study consists of seven chapters and two appendices.

In Chapter 1 the importance of giant clams for Pacific Islanders is summarised and ICLARM's mariculture activities in Solomon Islands are described. An ethnographic introduction to Solomon Islands is provided in Chapter 2, with emphasis on rural systems of production and their implications for mariculture. In Chapter 3 the traditional importance of giant clams is examined from a historical and comparative perspective. Such topics as harvesting patterns, food preferences, post-harvest handling, use in material culture and religious significance are described.

Traditional knowledge and beliefs regarding giant clams forms the focus of Chapter 4. Information on traditional mariculture, 'clam gardens', and taxonomic lists in 19 local languages are also provided.

Chapter 5 is devoted to an examination of ICLARM's village-level giant clam cultivation trials. The implications of customary law — and especially traditional village-based systems of marine resources management — for mariculture are described in Chapter 6. Village-level organisation for giant clam mariculture is the topic of the final chapter.

The study concludes with two appendices. The first provides detailed information on traditional post-harvest uses of giant clams, and the second, by Karen Leivestad, gives traditional recipes for preparing meals that include giant clam meat.

Ordering information: Purchasers in the Americas should contact

International Specialised Book Services
5804 N.E. Hassalo Street
Portland, Oregon 97213-3644
USA

using the airmail price (below).

Purchasers in Europe may order from

Ernst S. Toeche-Mittler GmbH
Versandbuchhandlung
Hindenburgstrasse 33 - D-6100 Darmstadt
Germany

using the airmail price (below)

All others should send pre-paid orders to

Publications
ICLARM
MCPO Box 2631
0718 Makati
Metro Manila
Philippines

Prices

USD5.0 (surface mail) and USD8.0 (airmail). USD only, in international money orders, bank draft or UNESCO coupons. USD checks from a US-based bank only (clearance fees from other banks are too high).

Case study of a traditional marine management system: Sasa Village, Macuata Province, Fiji

Case study of a traditional marine management system: Sasa Village, Macuata Province, Fiji. Field Report 94/1, Project RAS/92/T05 Case Studies on Traditional Management Systems in the South Pacific. Gracie M. Fong. 1994. Published by the Forum Fisheries Agency (FFA), Honiara and Food and Agriculture Organisation (FAO), Rome. xii, 85pp,. maps, tables, appendices (no price indicated).

This document presents the findings of a case study of a traditional marine management system in Fiji. It aims to assist South Pacific governments and organisations operating in the region to assess the feasibility of developing inshore fisheries management systems.

The report provides a description of traditional fisheries management in Fiji, with emphasis on those in the four administrative districts of Dreketi, Macuata, Sasa and Mali. There follows a discussion of traditional fisheries knowledge among Sasa and Navakasobu villagers. The scope and effectiveness of the 1989 fisheries conservation, management and enforcement measures adopted in Sasa village are then evaluated. The possibility of giving legal support to such traditional measures is then considered. The adaptability of the Sasa village approach to other South Pacific countries is analysed.

A Guide to the literature of traditional community-based fishery management in the Asia-Pacific tropics

Kenneth Ruddle (1994) *A Guide to the literature of traditional community-based fishery management in the Asia-Pacific tropics. FAO Fisheries Circular No. 869,* Rome, FAO, 114 pp. (no price given). Contact Publications Unit, Fisheries Division, FAO, Rome.

During the last fifteen years there has been a surge of interest in traditional community-based systems of marine resource management. Judging from requests for information and 'reading lists', there has also been a noticeable increase in the number of university theses and dissertations on the subject in the Asia–Pacific region.

It is largely in response to those frequent requests that this guide to some of the published and unpublished literature has been written. No pretence is made at completeness; the author has included only some of the materials that he has collected.

The introductory section discusses the geographical distribution of systems, and their principal characteristics, including authority, rights, rules, monitoring, accountability and enforcement. It notes that information on these systems is fragmentary and much remains anecdotal and unsynthesised.

The main body of the publication provides, on a country-by-country basis, a summary of the present knowledge on traditional management systems of marine and estuarine fisheries in the Asia–Pacific tropics.

It is intended to publish supplementary materials from the Pacific Islands in this *Information Bulletin*. To this end, readers are urged to send contributions to the SIG co-ordinator.

International Workshop on Traditional Marine Tenure and the Sustainable Management of Marine Resources in Asia and the Pacific

The International Ocean Institute, in collaboration with the University of the South Pacific Marine Studies Programme, Western Pacific Fisheries Consultative Committee, and the Government of France, organised an *International Workshop on Traditional Marine Tenure and the Sustainable Management of Marine Resources in Asia and the Pacific*, held 4–8 July, 1994 on the USP campus, at Suva, Fiji. The Workshop was sponsored by UNDP, CIDA, the Government of France, and UNESCO.

The workshop was organised into four sessions:

1. Traditional marine tenure in the 90s;

2. Traditional marine tenure and management: challenges, experiences and prospects;

3. Traditional marine tenure and sustainable resource use; and

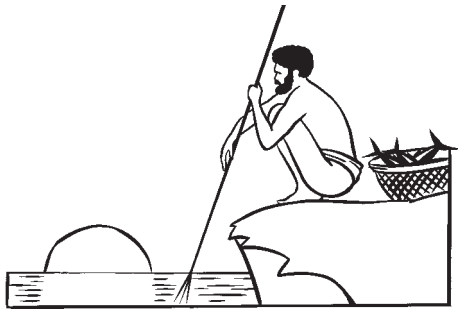
4. Transfer of traditional marine tenure and management technology.

The organisers hope to have the 300+ page proceedings available by October, 1994.

For further information and to place orders, contact Professor G. Robin South, IOC-South Pacific, Marine Studies Programme, University of the South Pacific, P.O. Box 1168, Suva, Fiji, for the following publication: South, G.R., D. Goulet, S. Tuqiri, and M. Church (eds.) (1994), *Traditional marine tenure and sustainable management of marine resources in Asia and the Pacific*. IOC-SP, Suva. (Price not yet fixed).

TRADITIONAL MARINE RESOURCE MANAGEMENT AND KNOWLEDGE

INFORMATION ON PROGRAMMES AND PROJECTS IN THE REGION



Women and Fisheries Network

The Women and Fisheries Network brings together individuals interested in advancing women's development in the fisheries sector.

It was founded by women researchers and activists from regional institutions, national development groups and women's organisations.

The Network is intended to link researchers and activists interested in fisheries development issues with women and women's groups who are engaged in fisheries activities in the region.

The idea of the Women and Fisheries Network was born during a two-day regional workshop on Women in Fisheries which was convened by Canadian University Services Overseas (CUSO), funded by the International Centre for Ocean Development (ICOD), and held in Suva in August 1992.

The workshop discussed the importance of women's fisheries activities to the economic and food security of Pacific families and communities, and women's general exclusion from fisheries development resources and training at both national and regional levels.

It decided that research and advocacy within the region was necessary both to protect women's livelihoods in fisheries and to advance women's development in fisheries.

Why a Women and Fisheries Network?

Women's contribution to fisheries is often ignored or neglected. Although the debate on women and development has raised awareness of the role of women in agriculture around the world, the role and contribution of women in the fisheries sector is not as well known. Research into and funding of women in fisheries by government or development agencies is also limited.

Women contribute to fisheries in many parts of the world, but particularly in the South Pacific.

- Women harvest aquatic resources more than men;
- Women's fisheries produce a high proportion of the daily protein intake;
- Women's fisheries are an important part of subsistence and provide family income;
- Women spend a lot of labour time in fisheries for all of the above reasons.

Gender bias in fisheries

Despite women's being crucially involved in subsistence and in small scale commercial fisheries, fisheries is considered a male field of activity only.

- Men's fishing is given higher status and support officially and culturally;
- Fisheries divisions concentrate on training and projects for men;
- Emphasis on high technology and deep-sea fisheries excludes due attention to inshore and subsistence fishing where women are involved.

Why the focus on women and fisheries?

- The importance of inshore fishing and women's contribution to subsistence;
- The nutritional contribution of women's fishing;
- Environmental impacts often affect women's fishing activities;

- Fish processing often involves mainly women;
- Increasing involvement of women workers in foreign-owned fish canning factories e.g. Noro (Solomon Islands), Levuka (Fiji);
- The need for training and resources for women's fisheries to support women's economic activities;
- Women are important resource managers in fisheries.

Aims of the Network

The aims of the Women and Fisheries Network are:

- Recognition of the importance of Pacific women's fisheries activities in semi-subsistence communities and in domestic food markets;
- Access for Pacific women to fisheries development resources and training;
- Representation for women in fisheries decision-making; and
- Sustainable forms of development for the Pacific.

The workplan for the Network

1. Encourage, support and share the results of research on women's fisheries activities;
2. Inform, educate and mobilise women on fisheries issues and developments;
3. Lobby for development support for women's fisheries activities, including access to fisheries technology, training and project opportunities;
4. Seek representation for women in fisheries decision-making at both national and regional levels;
5. Provide critical analyses, from a women-and-development perspective, of national and regional fisheries issues for both national and regional forums;
6. Link with development groups regionally and internationally (and within donor countries) to strengthen campaigns aimed at protecting or advancing women's fisheries interests and sustainable forms of development in the region.

Membership

The Network invites membership from individuals and women's groups who are interested in supporting its work or contributing in some way towards advancing women's role in fisheries.

Members receive a quarterly newsletter and can attend meetings of the Network.

Contact person

Milika Naqasima
SPAS - University of the South Pacific
P.O. Box 1168 – Suva – Fiji
Phone: (679) 313900 ext. 2559
Fax: (679) 302548

The VAKA MOANA (Ocean Roads of the Pacific) Programme of UNESCO

Guiding principles

Description

Vaka Moana: the Ocean Roads is a large-scale thematic programme devised under the United Nations World Decade for Cultural Development and administered by UNESCO.

It has been set up in response to the growing awareness among Pacific peoples of the importance of their heritage and of the need both to maintain and to develop further all the dimensions of that heritage. The unifying theme of the Programme is the Pacific Ocean, the generating source of the people's resources, and the pathway linking the lands and the peoples of the region.

The title **Vaka Moana** comes from the widespread use in the Pacific of the words **Moana** for ocean and **Vaka** for canoe. Vaka Moana enshrines many associated meanings, including various dimensions of traditional and contemporary culture, as well as those associated with sea voyages for exploration, migration and trade.

The intention of the planners of the Vaka Moana Programme, however, is that it should address a

broader range of activities, including the study of traditional and contemporary cultures, the reinforcement of traditional links, the conservation of resources and traditions, and economic development based on careful use of the region's resources. Fundamental to the philosophy of the World Decade for Cultural Development and to the Vaka Moana Programme is a commitment to the recognition of cultural, spiritual and social values in the development process.

Development objectives

The intention of the Programme is that it will lead to:

- a better understanding and appreciation of the cultural heritage and diversity of the Pacific peoples;
- the development of cultures and attitudes which build on that heritage while taking advantage of contemporary technologies and opportunities;
- a greater understanding of, and tolerance for, the values, practices and attitudes of others.

Operational goals

The Vaka Moana Programme has the following operational goals:

- The reinforcement of links between Pacific peoples through a better knowledge of their common historical links and dependence on the ocean;
- The promotion and dissemination of all forms of knowledge, both traditional and scientific, concerning the sea and its resources;
- The conservation, management and appropriate use of these resources for the benefit of the peoples of the region;
- The promotion of all forms of art which have the common theme of the sea;
- The involvement of all peoples of the various island countries of the Pacific, including those from non-independent countries.

Central themes

- **Peopling of the Pacific**

  Linguistics, archaeology, anthropology
  –biological anthropology
  –belief systems
  –social systems

  Migrations

  Land and sea uses

  Oral history / tradition

  Re-establishing links

- **Culture and tourism**

  Traditional and contemporary art forms
  –performing and visual arts

  Ecotourism

  Marketing and promotion of the Vaka Moana Programme

  Museums

- **Culture and science**

  Marine resources

  Traditional land and sea uses

  Medicine

  Conservation

  Technology

- **Contemporary Pacific societies**

  Economics

  Political and other structures

  Cultural pluralism

  Law and society

  Communications

  Religion

  Culture and education

Resources

Funding is being sought from various sources. It will be used for activities under the Vaka Moana Programme within the following categories:

- Research and publications;
- Education and training;
- Cultural events; and
- Conferences, seminars and workshops

Administration

The Vaka Moana Programme is administered through the UNESCO Office for the Pacific States in Apia, and is governed by a Board comprising representatives of Melanesia, Micronesia, Polynesia, Aboriginal Australia, the World Decade Secretariat, the South Pacific Commission and the University of the South Pacific.

The Programme is serviced by the staff of the Apia Office and supported by the Australian and New Zealand National Commissions for UNESCO. The Executive Director is Mr Mali Voi, the Pacific Cultural Adviser at the UNESCO Office for the Pacific States, Apia.

For further information, please contact:

Mr Mali Voi
Cultural Adviser
UNESCO Office for the Pacific States
P.O. Box 5766 - Matautu-uta - Apia
Western Samoa
Telephone: (685) 24276
Fax: (685) 22253

Profitable Environmental Protection Project

The Profitable Environmental Protection Project (PEP) is an integrated conservation and development project that seeks to explore the linkages between private enterprise and conservation of biological systems.

PEP's principal marine project involves North Espiritu Santo in Vanuatu, particularly the coastline between Port Olry and Hog Harbour, including the pristine coral gardens of Elephant Island.

Vanuatu's marine ecosystems are rich and diverse. The near-shore coastal resources cover an area approximately 448 square kilometres in size; over 50 per cent of the country's rural population engage in fishing.

The Vanuatu National Marine Resources Survey (1990) recognised Elephant Island as one of four exceptionally beautiful coral gardens in the country. Potential threats to the pristine nature of the resource include increasing cruise-ship tourism and SCUBA diving; some evidence of over-fishing exists.

To discourage unrestricted exploitation of this area, we plan to explore management options and produce recommendations to address long-term viability of the site.

PEP is in the process of developing a monitoring system to assess water-quality parameters; conduct coral and fish censuses; investigate and document traditional and commercial fishing—the techniques and efforts; and produce marine environmental education services.

PEP also works with local land owners and business enterprises to modify management practices as a means of maintaining environmental quality.

PEP, part of the United States contribution to the Global Environmental Facility (GEF), tests the hypothesis that enterprises which are ecologically beneficial, or at least benign and sustainable, can also be profitable and that nature conservation can be integrated with development.

We seek to facilitate marine conservation by directly involving local communities with management of marine ecosystems, and by creating partnerships with national, regional, and local governments, as well as entrepreneurs, academic institutions, and international, regional and local environmental and conservation organisations.

For further information, contact:

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Donna Kalfatak
Foundation for the Peoples of the South Pacific
P.O. Box 367
Espiritu Santo
Vanuatu
Telephone: (678) 22915
Fax: (678) 24510